

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:)	
)	
Saint-Hilaire et al.)	Examiner: Knapp, Justin R.
)	
Serial No. 09/989,136)	Art Unit: 2182
)	
Filed: November 20, 2001)	
)	
For: METHOD AND ARCHITECTURE TO)	
SUPPORT INTERACTION BETWEEN)	
A HOST COMPUTER AND REMOTE)	
DEVICES)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION PURSUANT TO 37 C.F.R. §1.131

Sir:

We, Ylian Saint-Hilaire and Jim W. Edwards, hereby declare that:

1. We are the inventors of the above-captioned patent application and the subject matter described and claimed therein.
2. Intel Corporation of Santa Clara, California, is the assignee of the above-captioned patent application.
3. We were employed by Intel Corporation at the time the above-captioned patent application was filed.
4. Prior to November 9, 2001, We (at least one of us for each independent claim) conceived of the invention according to each of independent claims 1, 6, 16, 22, 29, 31, 36, and 41 of the above-captioned patent application in this country, as evidenced by Exhibit A, B, and C. The date stamp, in unredacted form, shows that the concept identified in each of these documents document was written prior to November 9, 2001.

5. Exhibits A, B, and C are copies of Intel invention disclosures (with redacted dates) that Ylian Saint-Hilaire and Jim Edwards prepared and submitted to an Intel patent review committee prior to November 9, 2001. The invention disclosures concern subject matter disclosed in the above-captioned patent application.

6. Ylian Saint-Hilaire met with patent attorney R. Alan Burnett for an invention disclosure meeting in Hillsboro, Oregon prior to November 9, 2001 to discuss the subject-matter of the above-captioned patent application.

7. We reduced the present invention to practice, with due diligence from a date prior to November 9, 2001 to November 20, 2000 (the filing date of the above-captioned patent application) in this country.

We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the above-captioned application or any patent issued thereon.

Respectfully submitted,

Date January 12, 2005

Ylian Saint-Hilaire
Ylian Saint-Hilaire

Date January 14, 2005

Jim W. Edwards
Jim W. Edwards

Exhibit A

INTEL INVENTION DISCLOSURE

ATTORNEY-CLIENT PRIVILEGED COMMUNICATION

located at <http://legal.intel.com>

DATE:

Redacted 20283

TRC / IAG / TRC / CEL

Redacted Date

It is important to provide accurate and detailed information on this form. The information will be used to evaluate your invention for possible filing as a patent application. When completed and signed, please return this form to the **Legal Department at JF3-147**. You can submit electronically via e-mail to **"Invention disclosure submission"** if all of the information is electronic, including drawings and supervisor approval. If you have any questions, please call **264-0444**.

1. **Inventor:** Saint-Hilaire Ylian
Last Name **First Name** **Middle Initial**
Phone (503) 264-2188 **M/S:** JF1-273 **Fax #** (503) 264-1805
Citizenship: Canadian **WWID:** 10610963 **Contractor:** YES NO X
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City Hillsboro **State** OR **Zip** 97124 **Country** US
***Corporate Level Group (e.g. IABG, NCG, CEG)** IAG **Division** TRL **Subdivision** CEL
Supervisor* Jim Edwards **WWID** 10065024 **Phone** (503) 264-8464 **M/S:** JF1-273

Inventor: Edwards Jim W
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*Corporate Level Group (e.g. IABG, NCG, CEG) IAG Division TRL Subdivision CEL
Supervisor* Mark Abel WWID 10059928 Phone (503) 264-8483 M/S: JF1-273

***If you are unsure of this information, please discuss with your manager.**

(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

2. Title of Invention: Remote PC Hosted devices

3. What technology/product/process (code name) does it relate to (be specific if you can):
Home Devices, home automation, PC in the Home, home adapter, home network.

4. Include several key words to describe the technology area of the invention in addition to # 3 above: Networks, wireless, Extended PC

5. Stage of development (i.e. % complete, simulations done, test chips if any, etc.): Concept

6. (a) Has a description of your invention been, or will it shortly be, published outside Intel:

NO: ☒ YES: ☐ If YES, was the manuscript submitted for pre-publication approval? ☐

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INTEL LEGAL TEAM

(b) Has your invention been used/sold or planned to be used/sold by Intel or others?

NO: X YES: _____ DATE WAS OR WILL BE SOLD: _____

- (c) Does this invention relate to technology that is or will be covered by a SIG (special interest group)/standard/ or specification?

NO: X YES: _____ Name of SIG/Standard/Specification: _____

- (d) If the invention is embodied in a semiconductor device, actual or anticipated date of tapeout? _____

- (e) If the invention is software, actual or anticipated date of any beta tests outside Intel: _____

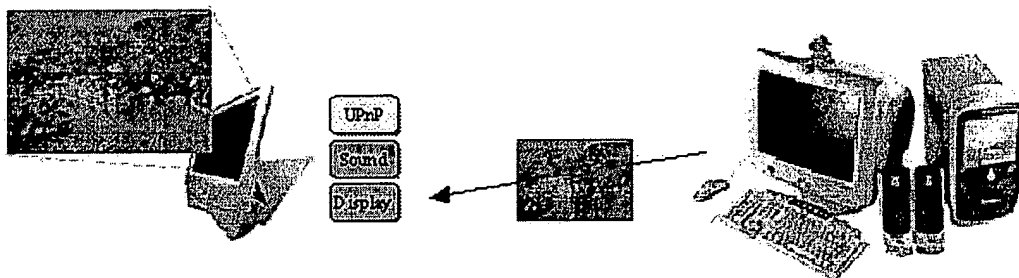
7. Was the invention conceived or constructed in collaboration with anyone other than an Intel blue badge employee or in performance of a project involving entities other than Intel, e.g. government, other companies, universities or consortia? NO: X YES: _____ Name of individual or entity: _____

8. Is this invention related to any other invention disclosure that you have recently submitted? If so, please give the title and inventors: No

**PLEASE READ AND FOLLOW THE DIRECTIONS ON
HOW TO WRITE A DESCRIPTION OF YOUR INVENTION**

Please attach a description of the invention to this form and include the following information:

1. Describe in detail what the components of the invention are and how the invention works.



Picture Frame

Extended PC

This invention describes a method by which a low-cost home appliance (or any device) would be built with minimal software and hardware. This device would be connected on the home network (or any network) and be completely driven by the PC.

Using this invention a picture frame device can be built with no storage and minimal memory (when compared to similar devices today). The computer in the home detects all such devices using UPnP (Universal Plug & Play) or another service discovery mechanism. Once the PC detects a device, it obtains (e.g. using UPnP) further information about the device and its capabilities.

The PC interacts with a device using a set of services offered by that device. These services may include "Remote Display", "Remote Audio", "Remote Input", "Remote Video", "Remote Software Update" and other services. Each service is discovered using UPnP or its equivalent. UPnP also provides a specific description on how to use the service.

Remote Display

This service would provide a simple TCP connection port on which the PC would send a stream of "Display this picture at position X,Y" type commands. Each of these commands makes the device overwrite its frame buffer with a new picture at the given position. The UPnP information

- on this service would include the screen size, the color depth, the file formats supported and if synchronization is supported. The computer uses this information to process pictures to be in the format, color depth, and size (to prevent overflowing device's frame buffer) required for the device. The computer will also do any scaling needed (if a picture must be re-sized for a given device).

An optional synchronization service allows the computer to place time markers within the picture command stream. For example: if the computer must animate a small portion of the screen at 15 frames per seconds, the computer will insert time markers to indicate when this picture must be displayed. This allows the device to synchronize with its refresh rate and also eliminates network jitter that would cause the animation to be choppy. The display service sends back small messages indicating when it failed to meet the specified time requirements. This allows the PC to adapt the content to the device and network conditions.

Remote Audio

The UPnP description of this service includes the number of channels (speakers), the rate at which the device can play, the quality (number of bits) and supported sound formats (PCM for example). When applications running on the PC want to play sounds and music, the PC is responsible for mixing and converting this sound to a format the remote audio device will support.

In one implementation of this service, a TCP socket is opened to the remote audio device (port number given by the service's UPnP description). Both the device and PC TCP sockets can be optionally configured to buffer only a small amount of data (depending on sound quality, network latency and audio latency desired). The device simply reads PCM sound from the TCP socket and fills its sound buffer. If the device is unable to do so, it notifies the PC that there is a problem. The PC can adapt the sound quality to meet the device's performance or new network conditions.

Remote Input

The devices that can be built using this invention include many types of devices with input ranging from no input at all to pen-input, keyboard, mouse and buttons. UPnP is used to describe the existence of the input service. The information provided may include type of device, commands supported (buttons, positions (pen, mouse), clicks, wheel), etc

Some devices such as infrared remote controls might require code running on the PC to interpret the timing codes received and convert them to button push commands. The UPnP service might also be used in this case to advertise the presence of a custom input device and the URL link where the matching PC software required to support the device is located on the Internet. The PC can then automatically get and run this software (possibly signed, trusted software).

Other services such as Video, Software update, etc can be advertised and used in the same way. One of the most important points of this invention is that we are not defining a single "remoting" protocol, but rather a set of protocols, one for each service offered by the device. Each protocol is also defined to adapt to the specifics of the device. For example, some devices will play different audio formats at different rates; use different screen sizes at different color depths. The computer discovers this and adapts to it. This is also an important difference since, for example, current products require 640x480 display, mouse input at a minimum.

Technical Points

- The main goal and benefit is to drive much of the work that might be performed by a device onto the computer. This will result in cheaper devices.
- Each device may include one or more of the services described here. For example, some devices may not have an Input or a screen. This does not exclude them from using this invention. Each device advertises the services it has.

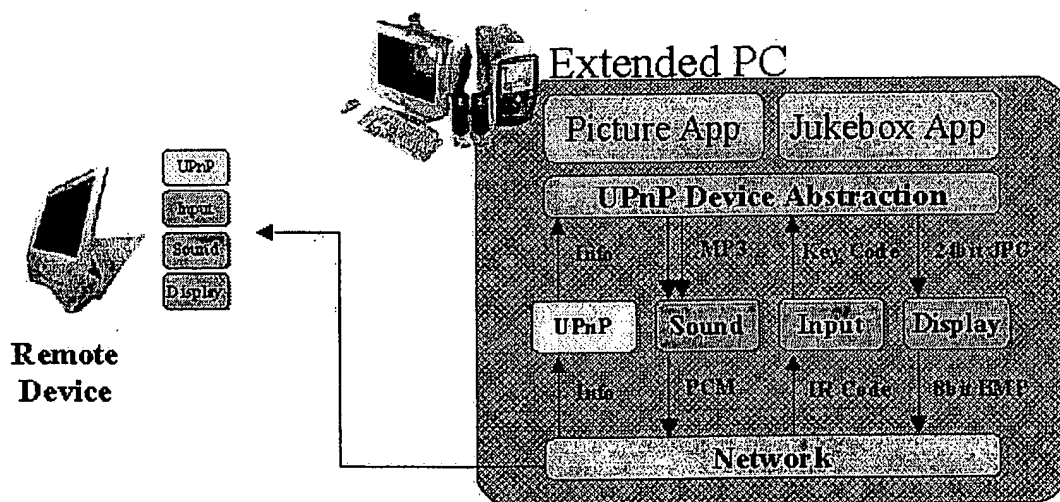
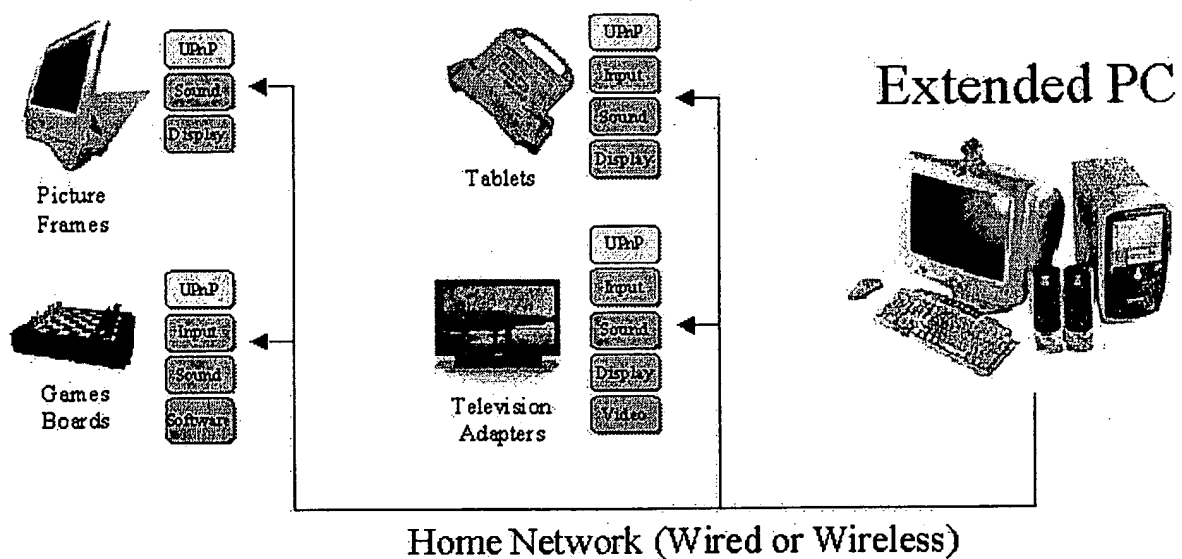
- The computer can drive many of these devices at the same time. Each device can be driven autonomously, but the computer can also create logical connections between the devices. For example a tablet device could be used as input to a picture frame device.

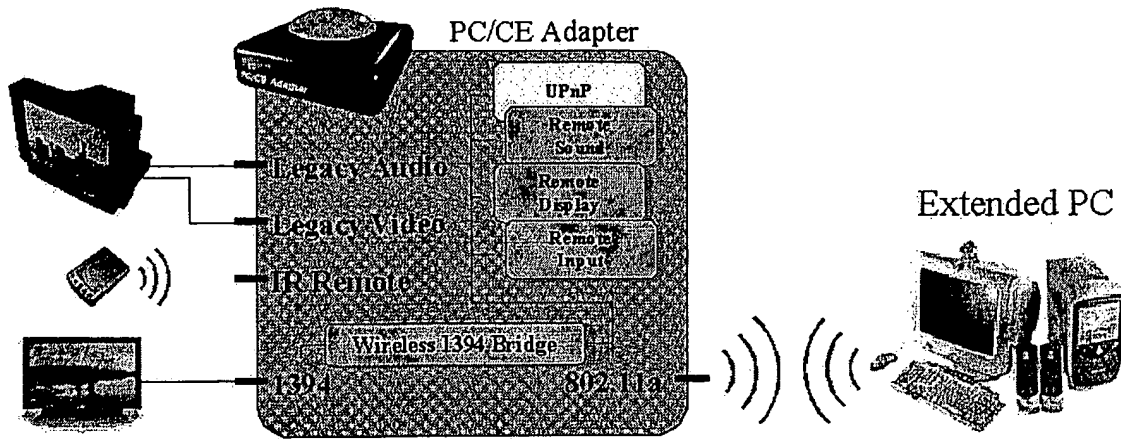
2. Describe advantage(s) of your invention over what is done now.

Currently, devices such as picture frames, tablets, setup boxes run fairly autonomously. With the existence of an always on, always connected Extended PC, these cheap devices can leverage the power of the PC to significantly lower their costs and make it possible to reuse existing capabilities provided by the PC which translates into lower TTM.

3. YOU MUST include at least one figure illustrating the invention.

If the invention relates to software, include a flowchart or pseudo-code representation of the algorithm.





4. Value of your invention to Intel (how will it be used?).

The Extended PC strategy attempts to "make the PC relevant in the home", this is in the face of a growing lineup of products that run in the home without the involvement of the PC. This invention adds value to devices through the PC's inherent processing, storage, and connectivity capabilities and it also makes it possible to build cheaper devices. This invention will be used in a reference design for a PC/CE adapter that links the PC to the entertainment system in a family room.

5. Explain how your invention is novel. If the technology itself is not new, explain what makes it different.

Remote display techniques have been focused on optimizing bandwidth and on a pull model where clients connect to large servers that host applications. For example: remote administration of servers using dialup lines or the Internet, or remote online assistance thru the Internet. This invention is completely different in that the PC now hosts a portion of functionality the customer would otherwise have to buy within each device. It also uses a push model where the PC automatically discovers and pushes content to the devices.

One of the most important differences with things that are currently done in this space is the device capability discovery. Contrary to other "terminal" products, this invention discovers the devices capabilities at runtime. In the invention: a monitor, user input, audio playback are all optional components of a device. The computer discovers what services (display, audio...) the device offers and loads software that will take advantage of these services.

6. Identify the closest or most pertinent prior art that you are aware of.

While many remoting products exist: Windows Terminal Server, WinFrame, X-Windows, PC Anywhere, Carbon Copy... They don't use the same technology and are in a separate field of use. There is no known prior art in this space.

7. Who is likely to want to use this invention or infringe the patent if one is obtained and how would infringement be detected?

Devices that rely on the PC to be turned on to work might be potentially infringing on this invention. Discovery protocols such as UPnP are easy to examine using a network packet sniffer. Protocols such as UPnP can easily be probed to look at the services they offer and information given about each service. Network sniffers can also look at how the protocols are used with each service.

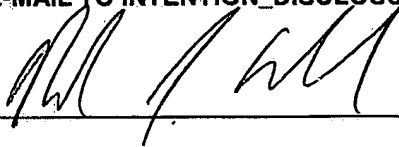
**HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM
OR FORWARD IT ELECTRONICALLY VIA E-MAIL TO INTENTION_DISCLOSURE_SUBMISSION**

DATE:



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SUPERVISOR:



BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID

Exhibit B

INTEL INVENTION DISCLOSURE

ATTORNEY-CLIENT PRIVILEGED COMMUNICATION
located at <http://legal.intel.com>

DATE: RedactedTRL
Comm / IAG / TRL / CELRedacted date

It is important to provide accurate and detailed information on this form. The information will be used to evaluate your invention for possible filing as a patent application. When completed and signed, please return this form to the Legal Department at JF3-147. You can submit electronically via e-mail to "invention disclosure submission" if all of the information is electronic, including drawings and supervisor approval. If you have any questions, please call 264-0444.

1. Inventor: Saint-Hilaire Ylian
Last Name First Name Middle Initial
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*Corporate Level Group (e.g. IABG, NCG, CEG) IAG Division TRL Subdivision CEL
Supervisor* Jim Edwards WWID 10065024 Phone (503) 264-8464 M/S: JF1-273

*If you are unsure of this information, please discuss with your manager.

(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

2. Title of Invention: Light Weight Remote Display & Synchronization
3. What technology/product/process (code name) does it relate to (be specific if you can):
Extended PC, Home Devices, PC in the Home, home adapter, home network, Display remoting.
4. Include several key words to describe the technology area of the invention in addition to # 3 above: Networks, wireless, Extended PC
5. Stage of development (i.e. % complete, simulations done, test chips if any, etc.): Concept
6. (a) Has a description of your invention been, or will it shortly be, published outside Intel:
NO: X YES: If YES, was the manuscript submitted for pre-publication approval?
IDENTIFY THE PUBLICATION AND THE DATE PUBLISHED:
- (b) Has your invention been used/sold or planned to be used/sold by Intel or others?
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- (c) Does this invention relate to technology that is or will be covered by a SIG (special interest group)/standard/specification?

NO: X YES: _____ Name of SIG/Standard/Specification: _____

- (d) If the invention is embodied in a semiconductor device, actual or anticipated date of tapeout? _____

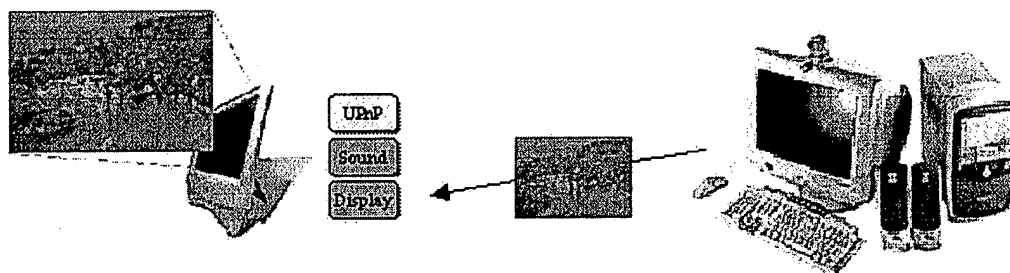
- (e) If the invention is software, actual or anticipated date of any beta tests outside Intel: _____

7. Was the invention conceived or constructed in collaboration with anyone other than an Intel blue badge employee or in performance of a project involving entities other than Intel, e.g. government, other companies, universities or consortia? NO: X YES: _____ Name of individual or entity: _____
8. Is this invention related to any other invention disclosure that you have recently submitted? If so, please give the title and inventors: No

**PLEASE READ AND FOLLOW THE DIRECTIONS ON
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Please attach a description of the invention to this form and include the following information:

1. Describe in detail what the components of the invention are and how the invention works.



Picture Frame

Extended PC

This invention describes a method for remotng a display to a low-cost networked home appliance (or any type of networked device with a display) that can be built with minimal software and hardware. This device can be connected anywhere on the home network (or any network) and be completely driven by the PC. Using this invention any PC application can display an interface on a remote device and synchronize small video and animations on the remote device.

Examples of display devices include a picture frame, a network tablet, an info terminal for kitchen management tasks, and a television display adapter, all of which are appropriately connected to the home network through a wired or wireless connection (e.g. 802.11a, 802.11b, Ethernet, HomeRF, HomePlug, 1394, etc.). Each of these devices advertises by some means the presence of a display on the network. A PC detects the presence of a display and sets up a data connection to the display.

Many of the devices as described above don't require large screen multimedia video but rather simple interaction with a user in order to accomplish specific tasks. For example, displaying pictures on a picture frame device only requires a simple user interface and simple images/animations (such as animated GIF's). In order to keep the device simple and as low cost as possible, the protocol used to talk to the device is kept very simple. In order to accomplish this goal, a basic set of primitives is supported. For example:

- **Reset** (int ProtocolVersion):
 - This primitive is used by the PC to reset the remote display. The display must clear itself and await instructions. This primitive also clears any state the device may have. The protocol is defined with minimal state, but reset is defined such as to future proof the device. If future protocol versions are defined, this command can be used to set which protocol version is going to be used by the PC.
- **Flush** (int TimeSinceLastSync)
 - Some display devices may support double buffering, where the device writes images to a hidden buffer and only displays the hidden buffer to the screen when asked to do so. Double buffering results in less display flicker. The "TimeSinceLastSync" parameter specifies the number of clock cycles to wait before issuing the Flush command.
 For example, suppose an NTSC TV adapter has double buffer support and it keeps track of the screen refresh (about 30 times per second). The device draws into its hidden buffer. When it receives a Flush(0) command, it displays the hidden buffer to the screen at the next screen refresh.
 If the PC wants to animate a GIF at 15 frames per seconds, it will need to send a animation frame to the device followed by a Flush(2) command. This will instruct the device to wait 2 refresh cycles before executing the Flush command.
 If an animation frame is not received in time due to network and device loads, another mechanism comes into play to allow a PC to adaptively recover: If more than 2 refresh cycles occur before the reception of the Flush(2) command, a FlushFailed() command is returned to the PC. This allows the PC to adapt the frame rate and animation size to better fit the current network load and ability of the device.
- **DrawFillBox** (x1, y1, x2, y2, Color)
 - Draw a fill box of the given color between the two point (x1,y2) and (x2,y2).
- **DrawImage** (x, y, image)
 - Draw an image at the (x1,x2) location. Here, the image can be in many different formats. When the PC discovers the device on the network, it must get the screen size, color depth and supported image formats. Information such as image width, height, and color are all encoded within the image format. The PC may use special features of some image types such as alpha-blending and transparency provided the device supports it.
- **PlaceVideoBox** (x1, y1, x2, y2)
 - In cases where the device supports streaming video as a separate service. This command allows the PC to place the video in a portion of the screen. Generally, the PC will set up the position of the video window and start streaming the video via a separate service.
- **Repaint** ()
 - On occasion a device may lose the entire display content. To recover, the device can ask the PC to resend a complete update of the screen via the Repaint command.
- **FlushFailed** ()
 - See Flush command. This command allows the PC to kept track of the quality of the animated output and adjust accordingly.

Technical Points

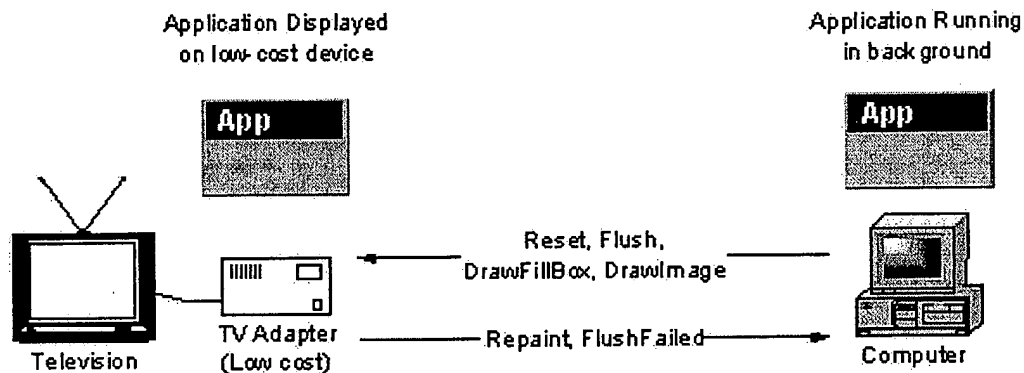
- Only Reset() and DrawImage() are required commands. All other commands are optional. The list of supported commands, display size, color depth and other information is given to the PC at discovery time. The PC must adapt to the restrictions of the device.
- Perfectly synchronized animations can be played on a device that supports the Flush() and FlushFailed() commands since the device animates the frames based on its own clock. If these commands are not available, the PC can still animate, but the quality of the animation is subject to network conditions.
- As defined, the Flush command synchronizes based on a device side clock. It is also possible to refine this command to also synchronize based on audio time stamps.
- Devices can also optionally support a Move() command that moves a block from a portion of the frame buffer to another. This allows for quick scrolling of graphics into the frame buffer.

2. Describe advantage(s) of your invention over what is done now.

Currently, devices such as picture frames, tablets, setup boxes run fairly autonomously. With the existence of an always-on, always-connected Extended PC, these devices can leverage the power of the Extended PC to significantly lower their costs and make it possible to reuse existing capabilities provided by the PC (which translates into lower TTM).

This invention provides an excellent, cost effective way of building a remote display of any kind. It is much lighter weight than similar "remote display" terminal software used on the PC. It also allows for synchronization of the frames to provide excellent visual quality for small animations and small video.

3. **YOU MUST include at least one figure illustrating the invention.**
If the invention relates to software, include a flowchart or pseudo-code representation of the algorithm.



4. **Value of your invention to Intel (how will it be used?).**

The Extended PC strategy attempts to "make the PC relevant in the home", in the face of a growing lineup of products that run in the home without the involvement of the PC. This invention adds value to devices through the PC's inherent processing, storage, and connectivity capabilities. It also makes it possible to build cheaper devices. This invention will be used in a reference design for a PC/CE adapter that links the PC to the entertainment system in a family room.

5. **Explain how your invention is novel. If the technology itself is not new, explain what makes it different.**

Remote display techniques have been focused on optimizing bandwidth and on a pull model where clients connect to large servers that host applications. For example: remote administration of servers using dialup lines or the Internet, or remote online assistance thru the Internet. This invention is completely different in that the PC now hosts much of the functionality the customer would otherwise have to buy within each device. This remote display invention uses a push model where the PC constantly push's content to the devices.

6. **Identify the closest or most pertinent prior art that you are aware of.**

While many remoting products exist (e.g. Windows Terminal Server, WinFrame, X-Windows, PC Anywhere, Carbon Copy) they don't use the same approach to display remoting and are in a separate field of use. There is no known prior art in this space.

7. **Who is likely to want to use this invention or infringe the patent
if one is obtained and how would infringement be detected?**

Devices that rely on the PC to be turned on to work might be potentially infringing on this invention. Network sniffers can look at how the protocols are used with each service. Organizations that build low-cost devices that include a display with a PC-hosted user interface may infringe on the Invention. Analyzing the protocol used would detect the infringement.

**HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM
OR FORWARD IT ELECTRONICALLY VIA E-MAIL TO INTENTION_DISCLOSURE_SUBMISSION**

Redacted
DATE: SUPERVISOR:

BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS
DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID

Exhibit C

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TR4 IAG/ TR4 CEL

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Last Name First Name Middle Initial
Phone (503) 264-2188 M/S: JF1-273 Fax # (503) 264-1805
Citizenship: Canadian WWID: 10610963 Contractor: YES NO X
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City Hillsboro State OR Zip 97124 Country US
*Corporate Level Group (e.g. IABG, NCG, CEG) IAG Division TRL Subdivision CEL
Supervisor* Jim Edwards WWID 10065024 Phone (503) 264-8464 M/S: JF1-273

(PROVIDE SAME INFORMATION AS ABOVE FOR EACH ADDITIONAL INVENTOR)

2. Title of Invention: Adaptive Remote Input Service
3. What technology/product/process (code name) does it relate to (be specific if you can):
Extended PC, Home Devices, PC in the Home, home adapter, home network, Display remoting, Input remoting
4. Include several key words to describe the technology area of the invention in addition to # 3 above: Networks, wireless, Extended PC
5. Stage of development (i.e. % complete, simulations done, test chips if any, etc.): Prototypes
6. (a) Has a description of your invention been, or will it shortly be, published outside Intel:
NO: X YES: _____ If YES, was the manuscript submitted for pre-publication approval? _____
IDENTIFY THE PUBLICATION AND THE DATE PUBLISHED: _____
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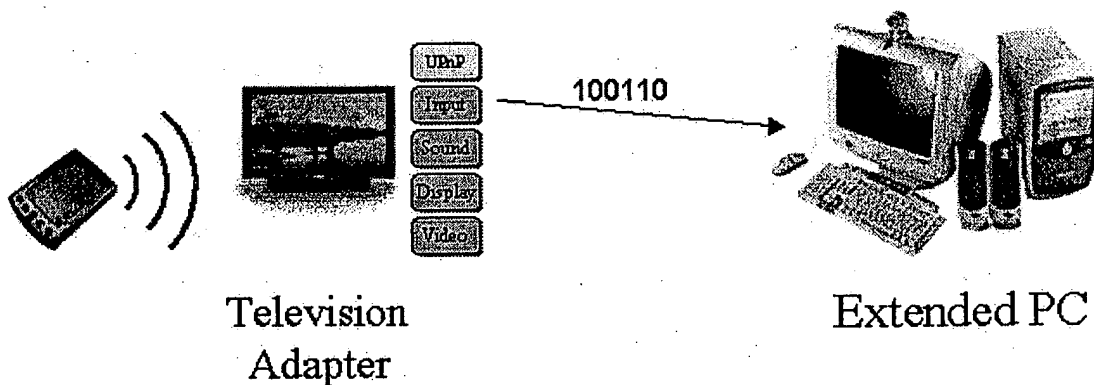
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Please attach a description of the invention to this form and include the following information:

1. Describe in detail what the components of the invention are and how the invention works.



This invention describes a method for remotng input from a low-cost networked home appliance (or any type of networked device with input) to a PC in such a way that the device can be built with minimal software and hardware. This device can be connected anywhere on the home network (or any network) and can be completely driven by the PC. Using this invention any device can send user input information to a PC that will interpret the user input and forward the command to the PC hosted device application.

Examples of input devices that can take advantage of this invention include picture frames, network tablets, information terminals, kitchen management devices and television display adapters, all of which are appropriately connected to the home network through a wired or wireless connection (e.g. 802.11a, 802.11b, HPNA, Ethernet, HomeRF, HomePlug, 1394, etc.). Each of these devices advertises by some means (UPnP for example) the presence of a user input source on the network. The discovery system (UPnP) also tells the PC of the type of user input that can be expected from the input source: remote control, keyboard, mouse/pen/touch or custom. A PC detects the presence of an input source and sets up a data connection to it. It then receives the user input and dispatches the user events to an application.

In some cases, the device will send custom input data, or in other words, raw data generated by the user input. This could include, for example, the length of IR pulses generated by a TV remote control. During the discovery process, the PC is informed of all of the custom input "channels"

that the device has. For each of these channels, the device informs the PC of where it can obtain a code module that can interpret the raw data. Giving the PC one or more URL's to the code module located on the Internet generally does this. The code is also identifies with a unique identification number, this allows the user to load the appropriate code module for a different source (Disk, CDRom) and have the PC associate the code module to the correct input source.

A basic set of primitives is supported by this lightweight remote input service. These primitives could include:

- **KeyDown** (int keydata)
- **KeyPress** (int keydata)
- **KeyUp** (int keydata)
 - The three keyboard primitives match the well-known keyboard events used is almost all operating systems. KeyDown and KeyUp occur whenever a key is pushed or released, this generally includes all keys including control keys such as shift, ctrl, alt and function keys. The KeyPress event contains the resulting interpretation of the keystrokes such as small and large capitalization and keyboard repetitions.
- **MouseDown** (int x, int y, int buttndata)
- **MouseMove** (int x, int y, int buttndata)
- **MouseUp** (int x, int y, int buttndata)
 - The three pointer primitives match the well-known keyboard events used is almost all operating systems. These primitives are not limited to mouse movements, any other pointing device such as trackballs, movement keys, pen input, touch sensitive screen and magnetic screens can also use them. During input service discovery, the PC is informed of the maximum values of x and y. If the device has a display, these pointer primitives may have a different resolution any may not match the x and y of the display. The PC could scale the pointer position to the display.
- **RemoteControlKey** (int buttndata)
 - The framework also use a remote control primitive to send to applications button information that is not generally associated with a computer keyboard. These buttons include: Play, Pause, Forward, Next Track, VCR, DVD... Some frameworks could opt to not use the primitive and map these remote control keys to standard computer keyboard events.
- **Custom** (int channel_number, byte[] custom_data)
 - All keyboard, mouse and possibly remote control primitives are dispatched to the applications as-is. For some devices, data processing must be done before a keyboard or mouse event can be generated. In order to lower the cost of the device, the device uses the custom primitive to send raw input data to the PC for interpretation. The PC than sends the raw data into the appropriate code module for interpretation, the code module will generally return mouse or keyboard primitives that can than by dispatched to the applications. Each channel number can contain completely different raw data that must be sent to a different code module for interpretation.

Technical Points

- A device does not have to use all of these primitives, it can use all or a subset of them. Some devices may opt to use only custom data as input.
- An XML file will describe how the input service behaves, what primates are used, that are the bounds of mouse coordinates, that custom channels exist and where to obtain the code modules to interpret the raw input data.
- The XML file is written by the manufacturer of the device and validated using a XML-Schema file (XSD file). The Extended PC can also use the XSD file to validate the devices XML file before it is parsed.
- The code modules that is loaded by the Extended PC to support one or more custom channel should be signed and authenticated if it is loaded from the Internet, just like any other code modules downloaded from the Internet.
- Custom input code modules should also be sand-boxed, in other words, prevented from tampering system the files and other software on the Extended PC. This provides an extra level of security.

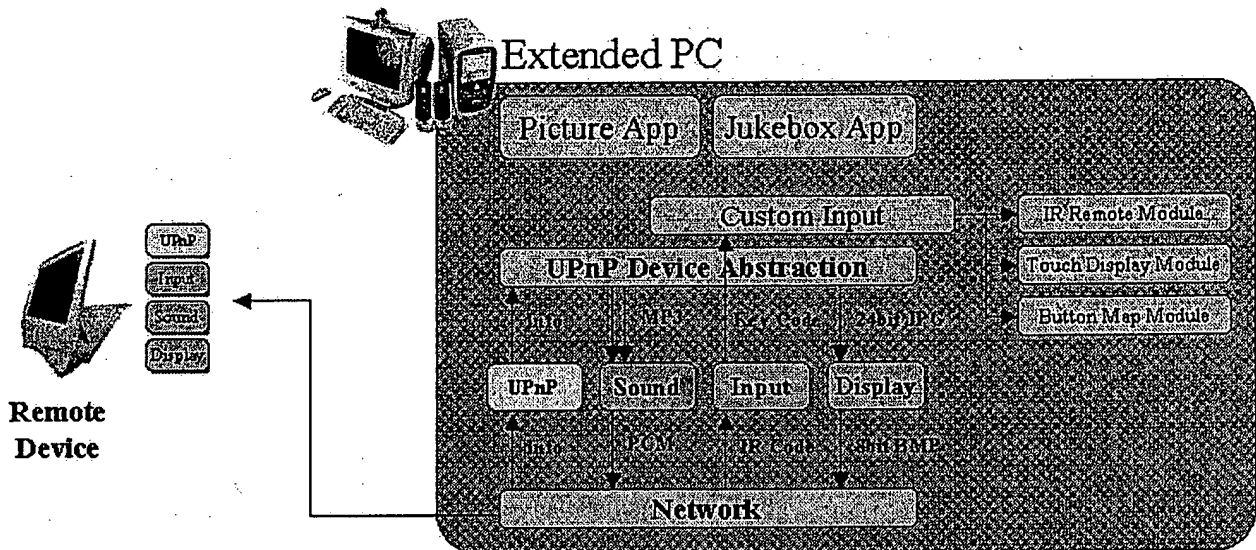
- One more instantiation of this service would do a similar operation in reverse. A code module on the PC could be loaded to generate a custom command to a device. For example, if a device has an IR transmitter, the PC could load a code module that sends an array of IR pulse timings to the device to re-transmission.

2. Describe advantage(s) of your invention over what is done now.

Currently, devices such as picture frames, tablets, setup boxes run fairly autonomously. With the existence of an always-on, always-connected Extended PC, these devices can leverage the power of the Extended PC to significantly lower their costs and make it possible to reuse existing capabilities provided by the PC (which translates into lower TTM).

This invention provides an excellent, cost effective way of building remote devices of any kind and remote the input of such devices to the PC. It is built to take maximum advantage of the PC's flexibility and processing power while diminishing the cost of building the device.

3. YOU MUST include at least one figure illustrating the invention. If the invention relates to software, include a flowchart or pseudo-code representation of the algorithm.



4. Value of your invention to Intel (how will it be used?).

The Extended PC strategy attempts to "make the PC relevant in the home", in the face of a growing lineup of products that run in the home without the involvement of the PC. This invention adds value to devices through the PC's inherent processing, storage, and connectivity capabilities. It also makes it possible to build cheaper devices. This invention will be used in a reference design for a PC/CE adapter that links the PC to the entertainment system in a family room.

5. Explain how your invention is novel. If the technology itself is not new, explain what makes it different.

Most electronic devices in the home today are standalone, or connect to the PC using protocols that require the device to process user input, interpret the user's commands and act on them with the assistance of the PC. The invention is novel in that it pushes even more processing that would be otherwise done on the device to the PC and allows for lower cost devices.

6. Identify the closest or most pertinent prior art that you are aware of.

While many remoting products exist (e.g. Windows Terminal Server, WinFrame, X-Windows, PC Anywhere, Carbon Copy) they don't use the same approach convey user input to the user. Many solutions are targeted to WAN applications and fairly rich remote clients. There is no known prior art in this space.

7. Who is likely to want to use this invention or infringe the patent if one is obtained and how would infringement be detected?

Devices that rely on the PC to be turned on to host applications on behalf of a device might infringe on this invention. Network sniffers can look at how the protocols handle user input. Organizations that build low-cost devices that include remoting user input to a PC-hosted user interface may infringe on the Invention. Analyzing the protocol used would detect the infringement.

**HAVE YOUR SUPERVISOR READ, DATE AND SIGN COMPLETED FORM
OR FORWARD IT ELECTRONICALLY VIA E-MAIL TO INTENTION_DISCLOSURE_SUBMISSION**

DATE: _____ SUPERVISOR: _____

BY THIS SIGNING, I (SUPERVISOR) ACKNOWLEDGE THAT I HAVE READ AND UNDERSTAND THIS
DISCLOSURE, AND RECOMMEND THAT THE HONORARIUM BE PAID